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WHAT IS CLAIMED IS:

We claim:

- 1. A method of synthesizing a mammalian, essentially pure, glycosylated Dkk protein comprising the steps of:
 - (a) harvesting culture media from a mammalian cell line with a nucleic acid encoding a mammalian Dkk protein in a replicating vector that synthesizes Dkk protein, wherein said Dkk protein comprises a signal peptide for expression and secretion into media of said Dkk protein;
 - (b) purifying the filtered culture media across an affinity gradient column;
 - (c) collecting Dkk protein containing fractions from the column;
 - (d) concentrating the Dkk protein containing fractions in a phosphate buffered saline in the presence of a detergent and EDTA to produce a concentrated, mammalian, essentially pure, glycosylated Dkk protein.
- 2. The method of claim 1, wherein the method further comprises purifying the Dkk protein using preparative and analytical size-exclusion chromatography.
- 3. The method of claim 1, further comprising treating the culture media with one or more protease inhibitors.
- 4. The method of claim 1, further comprising the step of filtering the culture media prior to purifying the culture media.
- 5. The method of claim 1, wherein the detergent is Tween, CHAPS, Noctyl-β-D-glucoside, triton X-100, or Nonidet P40.
- 6. The method of claim 1, wherein the affinity column is a metal affinity column.

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- 7. The method of claim 1, wherein the size exclusion column is a Superose-12 column, a Superdex-200 column, a Sephacryl column, or a Sephadex column.
 - 8. The method of claim 6, wherein the metal is nickel, zinc, or iron.
- 9. The method of claim 5, wherein the Tween is Tween-20 in the amount of about 0.01% to about 1% Tween-20 and EDTA is present in the amount of about 0.01 mM to about 2 mM EDTA.
- 10. The method of claim 5, wherein the Tween-20 is present from about 0.005% to about 0.1% or N-octyl- β -D-glucoside from 0.05 to 0.7% and the EDTA is present in the amount of about 0.5 mM EDTA.
- 11. The method of claim 5, wherein the N-octyl-β-D-glucoside is present in the amount from about 0.05% to about 0.7% and EDTA is present in the amount of about 0.5M.
- 12. The method of claim 9, further comprising the step of lyophilizing the essentially purified Dkk protein.
 - 13. The method of claim 1, wherein the Dkk protein is Dkk1.
 - 14. The method of claim 13, wherein the Dkk1 protein is human Dkk1.
- 15. The method of claim 3, wherein the treating step is additionally performed in the presence of a salt and imidazole.
- 16. The method of claim 15, wherein the salt is NaCl, LiCl, or KCl, and wherein the salt is in a final concentration of about 100 mM to about 1 M, and the imidazole is present in a final concentration of about 0.5 mM to about 50 mM imidazole.
- 17. The method of claim 15, wherein the salt is NaCl and is present at a final concentration of about 500 mM, and the imidazole is present at a final concentration of about 5 mM.

- 18. The method of claim 1, wherein the affinity gradient is an imidazole gradient of about 5 to about 1,500 mM imidazole in a metal column, and wherein the Dkk protein is tagged with histidine.
- 19. The method of claim 18, wherein the imidazole gradient is about a 20 mM to about a 1,000 mM imidazole gradient.
- 20. The method of claim 18, wherein the Dkk protein is human Dkk1, and the metal column is a nickel column.
- 21. The method of claim 1, wherein the mammalian cell line is HEK293T cells or HEK293 EPNA cells.
- 22. A purified, glycosylated Dkk protein produced by the method of claim 1.
- 23. The purified, glycosylated Dkk protein of claim 22, wherein the essentially purified, glycosylated Dkk1 protein is a human Dkk1 protein.
- 24. The purified, glycosylated Dkk protein of claim 22, wherein the Dkk protein further comprises a selectable tag.
- 25. The purified, glycosylated Dkk protein of claim 24, wherein the selectable tag is a c-myc tag or a His₆-tag.
- 26. The purified, glycosylated Dkk protein of claim 25, wherein the selectable tag is a His6-tag.
- 27. The purified, glycosylated Dkk protein of any of claims 18 or 19, wherein the Dkk protein further comprises a proteolytic cleavage site between the selectable tag and the Dkk protein.
- 28. A purified, glycosylated, mammalian Dkk1 protein having at least one of the following properties:

- (a) a molecular weight of approximately 40 kD ±2.0 kD as determined by SDS-PAGE;
 - (b) inhibits Wnt3A activity; and
- (c) co-immunoprecipitates a LRP5 protein or a fragment thereof comprising the ligand binding domain.
- 29. A purified, glycosylated, mammalian Dkk1 protein having at least one of the following properties:
 - (a) a molecular mass of about 36.1 kD to about 36.8 kD as determined by ESI-MS;
 - (b) a weight average molar mass of about 36 to about 46 kD of a Dkk1
 - (c) an S-value of 2.8 for monomeric Dkk1 protein as determined by AUC analysis:
 - (d) a weight average molecular mass of about 74 kD of a Dkk1 homodimer as determined by SEC-MALLS;
 - (e) a Dkk1-LRP5 binding stoichiometry of 1:1 as determined by AUC and/or SEC-MALLS;
 - (f) a molar extinction coefficient of 1.96x10⁴•M⁻¹•cm⁻¹ as determined based on the amino acid sequence of Dkk1 and changes in refractive index of Dkk1 due to glycosylation as measured using a high performance liquid chromatography refractometer;
 - (g) a change in specific refractive index increment of Dkk1 due to glycosylation as measured using a differential refractometer; and/or
 - (h) a dn/dc value of 0.186 for an unmodified Dkk1 protein and a dn/dc value of 0.130 to 0.180 of glycosylated protein due to post translational modifications.
- 30. The purified protein of claim 29, wherein the Dkk1 protein is human Dkk1 protein.
- 31. The purified protein of claim 29, wherein the protein comprises a His tag.

- 32. The purified, glycosylated Dkk protein of claim 24, wherein the selectable tag is a c-myc tag.
- 33. The purified protein of any of claims 31 or 32, wherein the Dkk protein further comprises a proteolytic cleavage site between the tag and the Dkk protein.
- 34. The purified protein of any of claims 28 or 29, wherein the protein inhibits Wnt3a activity by at least about 50%.